Shigeyoshi Tsutsui
Pierre Collet   *Editors*

Massively Parallel Evolutionary Computation on GPGPUs

Springer

Massively Parallel Evolutionary Computation On Gpgpus Natural Computing Series

Francisco Ortuño,Ignacio Rojas

Massively Parallel Evolutionary Computation On Gpgpus Natural Computing Series:

Massively Parallel Evolutionary Computation on GPGPUs Shigeyoshi Tsutsui,Pierre Collet,2013-12-05 Evolutionary algorithms EAs are metaheuristics that learn from natural collective behavior and are applied to solve optimization problems in domains such as scheduling engineering bioinformatics and finance Such applications demand acceptable solutions with high speed execution using finite computational resources Therefore there have been many attempts to develop platforms for running parallel EAs using multicore machines massively parallel cluster machines or grid computing environments Recent advances in general purpose computing on graphics processing units GPGPU have opened up this possibility for parallel EAs and this is the first book dedicated to this exciting development The three chapters of Part I are tutorials representing a comprehensive introduction to the approach explaining the characteristics of the hardware used and presenting a representative project to develop a platform for automatic parallelization of evolutionary computing EC on GPGPUs The 10 chapters in Part II focus on how to consider key EC approaches in the light of this advanced computational technique in particular addressing generic local search tabu search genetic algorithms differential evolution swarm optimization ant colony optimization systolic genetic search genetic programming and multiobjective optimization The 6 chapters in Part III present successful results from real world problems in data mining bioinformatics drug discovery crystallography artificial chemistries and sudoku Although the parallelism of EAs is suited to the single instruction multiple data SIMD based GPU there are many issues to be resolved in design and implementation and a key feature of the contributions is the practical engineering advice offered This book will be of value to researchers practitioners and graduate students in the areas of evolutionary computation and scientific computing **Applications of Evolutionary Computation** Giovanni Squillero,Kevin Sim,2017-04-03 The two volumes LNCS 10199 and 10200 constitute the refereed conference proceedings of the 20th European Conference on the Applications of Evolutionary Computation EvoApplications 2017 held in Amsterdam The Netherlands in April 2017 collocated with the Evo 2016 events EuroGP EvoCOP and EvoMUSART The 46 revised full papers presented together with 26 poster papers were carefully reviewed and selected from 108 submissions EvoApplications 2016 consisted of the following 13 tracks EvoBAFIN natural computing methods in business analytics and finance EvoBIO evolutionary computation machine learning and data mining in computational biology EvoCOMNET nature inspired techniques for telecommunication networks and other parallel and distributed systems EvoCOMPLEX evolutionary algorithms and complex systems EvoENERGY evolutionary computation in energy applications EvoGAMES bio inspired algorithms in games EvoIASP evolutionary computation in image analysis signal processing and pattern recognition EvoINDUSTRY nature inspired techniques in industrial settings EvoKNOW knowledge incorporation in evolutionary computation EvoNUM bio inspired algorithms for continuous parameter optimization EvoPAR parallel implementation of evolutionary algorithms EvoROBOT evolutionary robotics EvoSET nature inspired algorithms in software engineering and

testing and EvoSTOC evolutionary algorithms in stochastic and dynamic environments   Genetic Programming Penousal Machado,Malcolm I. Heywood,James McDermott,Mauro Castelli,Pablo García-Sánchez,Paolo Burelli,Sebastian Risi,Kevin Sim,2015-03-14 This book constitutes the refereed proceedings of the 18th European Conference on Genetic Programming EuroGP 2015 held in Copenhagen Spain in April 2015 co located with the Evo 2015 events EvoCOP Evo MUSART and Evo Applications The 12 revised full papers presented together with 6 poster papers were carefully reviewed and selected form 36 submissions The wide range of topics in this volume reflects the current state of research in the field Thus we see topics as diverse as semantic methods recursive programs grammatical methods coevolution Cartesian GP feature selection initialisation procedures ensemble methods and search objectives and applications including text processing cryptography numerical modelling software parallelisation creation and optimisation of circuits multi class classification scheduling and artificial intelligence   **EVOLVE - A Bridge between Probability, Set Oriented Numerics, and Evolutionary Computation V** Alexandru-Adrian Tantar,Emilia Tantar,Jian-Qiao Sun,Wei Zhang,Qian Ding,Oliver Schütze,Michael Emmerich,Pierrick Legrand,Pierre Del Moral,Carlos A. Coello Coello,2014-06-04 This volume encloses research articles that were presented at the EVOLVE 2014 International Conference in Beijing China July 1 4 2014 The book gathers contributions that emerged from the conference tracks ranging from probability to set oriented numerics and evolutionary computation all complemented by the bridging purpose of the conference e g Complex Networks and Landscape Analysis or by the more application oriented perspective The novelty of the volume when considering the EVOLVE series comes from targeting also the practitioner s view This is supported by the Machine Learning Applied to Networks and Practical Aspects of Evolutionary Algorithms tracks providing surveys on new application areas as in the networking area and useful insights in the development of evolutionary techniques from a practitioner s perspective Complementary to these directions the conference tracks supporting the volume follow on the individual advancements of the subareas constituting the scope of the conference through the Computational Game Theory Local Search and Optimization Genetic Programming Evolutionary Multi objective optimization tracks   High Performance Computer Applications Isidoro Gitler,Jaime Klapp,2016-04-07 This book constitutes the refereed proceedings of the 6th International Conference on Supercomputing ISUM 2015 held in M xico Mexico in March 2015 The 38 revised full papers presented were carefully reviewed and selected from 102 submissions The papers are organized in topical sections on perspectives in supercomputer infrastructure and applications parallel algorithms and optimization HPC applications and simulations   **A Critical Reflection on Automated Science** Marta Bertolaso,Fabio Sterpetti,2020-02-05 This book provides a critical reflection on automated science and addresses the question whether the computational tools we developed in last decades are changing the way we humans do science More concretely Can machines replace scientists in crucial aspects of scientific practice The contributors to this book re think and refine some of the main concepts by which science is understood drawing a fascinating picture of the developments we

expect over the next decades of human machine co evolution The volume covers examples from various fields and areas such as molecular biology climate modeling clinical medicine and artificial intelligence The explosion of technological tools and drivers for scientific research calls for a renewed understanding of the human character of science This book aims precisely to contribute to such a renewed understanding of science   Artificial Chemistries Wolfgang Banzhaf,Lidia Yamamoto,2024-03-19 An introduction to the fundamental concepts of the emerging field of Artificial Chemistries covering both theory and practical applications The field of Artificial Life ALife is now firmly established in the scientific world but it has yet to achieve one of its original goals an understanding of the emergence of life on Earth The new field of Artificial Chemistries draws from chemistry biology computer science mathematics and other disciplines to work toward that goal For if as it has been argued life emerged from primitive prebiotic forms of self organization then studying models of chemical reaction systems could bring ALife closer to understanding the origins of life In Artificial Chemistries ACs the emphasis is on creating new interactions rather than new materials The results can be found both in the virtual world in certain multiagent systems and in the physical world in new artificial reaction systems This book offers an introduction to the fundamental concepts of ACs covering both theory and practical applications After a general overview of the field and its methodology the book reviews important aspects of biology including basic mechanisms of evolution discusses examples of ACs drawn from the literature considers fundamental questions of how order can emerge emphasizing the concept of chemical organization a closed and self maintaining set of chemicals and surveys a range of applications which include computing systems modeling in biology and synthetic life An appendix provides a Python toolkit for implementing ACs   **Bioinformatics and Biomedical Engineering** Francisco Ortuño,Ignacio Rojas,2016-03-31 This book constitutes the refereed proceedings of the 4th International Conference on Bioinformatics and Biomedical Engineering IWBBIO 2016 held in Granada Spain in April 2016 The 69 papers presented were carefully reviewed and selected from 286 submissions The scope of the conference spans the following areas bioinformatics for healthcare and diseases biomedical image analysis biomedical signal analysis computational systems for modeling biological processes eHealth tools for next generation sequencing data analysis assistive technology for people with neuromotor disorders fundamentals of biological dynamics and maximization of the information extraction from the experiments in the biological systems high performance computing in bioinformatics computational biology and computational chemistry human behavior monitoring analysis and understanding pattern recognition and machine learning in the omics sciences and resources for bioinformatics   Swarm and Evolutionary computation Leszek Rutkowski,Marcin Korytkowski,Rafał Scherer,Ryszard Tadeusiewicz,Lotfi Zadeh,Jacek Zurada,2012-04-15 The volume LNCS 7269 constitutes the refereed proceedings of the International Symposium on Swarm Intelligence and Differential Evolution SIDE 2012 held in Zakopane Poland in April May 2012 in conjunction with the 11th International Conference on Artificial Intelligence and Soft Computing ICAISC 2012 proceedings published as two volume set LNAI 7267 and 7268 The 212 revised

full papers presented were carefully reviewed and selected from 483 submissions The volume is divided into two topical parts proceedings of the 2012 symposium on swarm intelligence and differential evolution and on evolutionary algorithms and their applications   **Applications of Evolutionary Computation** Cecilia Di Chio,Alexandros Agapitos,Stefano Cagnoni,Carlos Cotta,Francisco Fernández de Vega,Gianni A. Di Caro,Rolf Drechsler,Anikó Ekárt,Anna I. Esparcia-Alcázar,Muddassar Farooq,W.B. Langdon,Juan-J. Merelo-Guervós,Mike Preuss,Hendrik Richter,Sara Silva,Anabela Simões,Giovanni Squillero,Ernesto Tarantino,Andrea Tettamanzi,Julian Togelius,Neil Urquhart,Sima Uyar,Georgios N. Yannakakis,2012-03-24 This book constitutes the refereed proceedings of the International Conference on the Applications of Evolutionary Computation EvoApplications 2012 held in M laga Spain in April 2012 colocated with the Evo 2012 events EuroGP EvoCOP EvoBIO and EvoMUSART The 54 revised full papers presented were carefully reviewed and selected from 90 submissions EvoApplications 2012 consisted of the following 11 tracks EvoCOMNET nature inspired techniques for telecommunication networks and other parrallel and distributed systems EvoCOMPLEX algorithms and complex systems EvoFIN evolutionary and natural computation in finance and economics EvoGAMES bio inspired algorithms in games EvoHOT bio inspired heuristics for design automation EvoIASP evolutionary computation in image analysis and signal processing EvoNUM bio inspired algorithms for continuous parameter optimization EvoPAR parallel implementation of evolutionary algorithms EvoRISK computational intelligence for risk management security and defense applications EvoSTIM nature inspired techniques in scheduling planning and timetabling and EvoSTOC evolutionary algorithms in stochastic and dynamic environments   Theory and Practice of Natural Computing Carlos Martín-Vide,Roman Neruda,Miguel A. Vega-Rodríguez,2017-12-12 This book constitutes the refereed proceedings of the 6th International Conference on Theory and Practice of Natural Computing TPNC 2017 held in Prague Czech Republic December 2017 The 22 full papers presented in this book together with one invited talk werecarefully reviewed and selected from 39 submissions The papers are organized around the following topical sections applications of natural computing evolutionary computation fuzzy logic Molecular computation neural networks quantum computing   *Parallel Problem Solving from Nature - PPSN XII* Carlos Coello Coello,Vincenzo Cutello,Kalyanmoy Deb,Stephanie Forrest,Giuseppe Nicosia,Mario Pavone,2012-08-27 The two volume set LNCS 7491 and 7492 constitutes the refereed proceedings of the 12th International Conference on Parallel Problem Solving from Nature PPSN 2012 held in Taormina Sicily Italy in September 2012 The total of 105 revised full papers were carefully reviewed and selected from 226 submissions The meeting began with 6 workshops which offered an ideal opportunity to explore specific topics in evolutionary computation bio inspired computing and metaheuristics PPSN 2012 also included 8 tutorials The papers are organized in topical sections on evolutionary computation machine learning classifier systems image processing experimental analysis encoding EDA GP multiobjective optimization swarm intelligence collective behavior coevolution and robotics memetic algorithms hybridized techniques meta and hyperheuristics and applications

Soft Computing Applications for Database Technologies K. Anbumani,R. Nedunchezhian,2010-01-01 This book investigates the advent of soft computing and its applications in database technologies Provided by publisher

Proceedings of the Fourteenth International Conference on Management Science and Engineering Management Jiuping Xu,Gheorghe Duca,Syed Ejaz Ahmed,Fausto Pedro García Márquez,Asaf Hajiyev,2020-06-22 This book gathers the proceedings of the 14th International Conference on Management Science and Engineering Management ICMSEM 2020 Held at the Academy of Studies of Moldova from July 30 to August 2 2020 the conference provided a platform for researchers and practitioners in the field to share their ideas and experiences Covering a wide range of topics including hot management issues in engineering science the book presents novel ideas and the latest research advances in the area of management science and engineering management It includes both theoretical and practical studies of management science applied in computing methodology highlighting advanced management concepts and computing technologies for decision making problems involving large uncertain and unstructured data The book also describes the changes and challenges relating to decision making procedures at the dawn of the big data era and discusses new technologies for analysis capture search sharing storage transfer and visualization and in the context of privacy violations as well as advances in the integration of optimization statistics and data mining Given its scope it will appeal to a wide readership particularly those looking for new ideas and research directions Advanced Methodologies and Technologies in Artificial Intelligence, Computer Simulation, and Human-Computer Interaction Khosrow-Pour, D.B.A., Mehdi,2018-09-28 As modern technologies continue to develop and evolve the ability of users to adapt with new systems becomes a paramount concern Research into new ways for humans to make use of advanced computers and other such technologies through artificial intelligence and computer simulation is necessary to fully realize the potential of tools in the 21st century Advanced Methodologies and Technologies in Artificial Intelligence Computer Simulation and Human Computer Interaction provides emerging research in advanced trends in robotics AI simulation and human computer interaction Readers will learn about the positive applications of artificial intelligence and human computer interaction in various disciples such as business and medicine This book is a valuable resource for IT professionals researchers computer scientists and researchers invested in assistive technologies artificial intelligence robotics and computer simulation **Information and Knowledge Systems. Digital Technologies, Artificial Intelligence and Decision Making** Inès Saad,Camille Rosenthal-Sabroux,Faiez Gargouri,Pierre-Emmanuel Arduin,2021-08-27 This book constitutes the thoroughly refereed proceedings of the 5th International Conference on Information and Knowledge Systems ICIKS 2021 which was held online during June 22 23 2021 The International Conference on Information and Knowledge Systems ICIKS 2021 gathered both researchers and practitioners in the fields of Information Systems Artificial Intelligence Knowledge Management and Decision Support ICIKS seeks to promote discussions on various organizational technological and socio cultural aspects of research in the design and use of information and knowledge

systems in organizations The 10 full and 2 short papers presented in this volume were carefully reviewed and selected from 32 submissions They were organized in topical sections as follows knowledge systems and decision making machine learning recommender systems and knowledge systems and security artificial intelligence and information systems **Artificial Life and Evolutionary Computation** Johannes Josef Schneider,Mathias Sebastian Weyland,Dandolo Flumini,Rudolf Marcel Füchslin,2023-01-21 This book constitutes the proceedings of the 15th Italian Workshop on Artificial Life and Evolutionary Computation WIVACE 2021 held in Winterthur Switzerland in September 2022 The 14 full papers and 10 short papers presented in this volume were carefully reviewed and selected from 25 submissions The papers are organized in the following topical sections Networks Droplets Fluids and Synthetic Biology Robot Systems Computer Vision and Computational Creativity Semantic Search Artificial Medicine and Pharmacy Trade and Finance Ethics in Computational Modelling Chapters 4 5 6 7 22 and 24 are available open access under a Creative Commons Attribution 4 0 International License via link springer com **GPU-based Parallel Implementation of Swarm Intelligence Algorithms** Ying Tan,2016-04-15 GPU based Parallel Implementation of Swarm Intelligence Algorithms combines and covers two emerging areas attracting increased attention and applications graphics processing units GPUs for general purpose computing GPGPU and swarm intelligence This book not only presents GPGPU in adequate detail but also includes guidance on the appropriate implementation of swarm intelligence algorithms on the GPU platform GPU based implementations of several typical swarm intelligence algorithms such as PSO FWA GA DE and ACO are presented and having described the implementation details including parallel models implementation considerations as well as performance metrics are discussed Finally several typical applications of GPU based swarm intelligence algorithms are presented This valuable reference book provides a unique perspective not possible by studying either GPGPU or swarm intelligence alone This book gives a complete and whole picture for interested readers and new comers who will find many implementation algorithms in the book suitable for immediate use in their projects Additionally some algorithms can also be used as a starting point for further research Presents a concise but sufficient introduction to general purpose GPU computing which can help the layman become familiar with this emerging computing technique Describes implementation details such as parallel models and performance metrics so readers can easily utilize the techniques to accelerate their algorithmic programs Appeals to readers from the domain of high performance computing HPC who will find the relatively young research domain of swarm intelligence very interesting Includes many real world applications which can be of great help in deciding whether or not swarm intelligence algorithms or GPGPU is appropriate for the task at hand **Encyclopedia of Information Science and Technology, Fourth Edition** Khosrow-Pour, D.B.A., Mehdi,2017-06-20 In recent years our world has experienced a profound shift and progression in available computing and knowledge sharing innovations These emerging advancements have developed at a rapid pace disseminating into and affecting numerous aspects of contemporary society This has created a pivotal need for an innovative

compendium encompassing the latest trends concepts and issues surrounding this relevant discipline area During the past 15 years the Encyclopedia of Information Science and Technology has become recognized as one of the landmark sources of the latest knowledge and discoveries in this discipline The Encyclopedia of Information Science and Technology Fourth Edition is a 10 volume set which includes 705 original and previously unpublished research articles covering a full range of perspectives applications and techniques contributed by thousands of experts and researchers from around the globe This authoritative encyclopedia is an all encompassing well established reference source that is ideally designed to disseminate the most forward thinking and diverse research findings With critical perspectives on the impact of information science management and new technologies in modern settings including but not limited to computer science education healthcare government engineering business and natural and physical sciences it is a pivotal and relevant source of knowledge that will benefit every professional within the field of information science and technology and is an invaluable addition to every academic and corporate library **Adaptive and Natural Computing Algorithms** Andrej Dobnikar,Uroš Lotric,Branko Šter,2011-03-03 The two volume set LNCS 6593 and 6594 constitutes the refereed proceedings of the 10th International Conference on Adaptive and Natural Computing Algorithms ICANNGA 2010 held in Ljubljana Slovenia in April 2010 The 83 revised full papers presented were carefully reviewed and selected from a total of 144 submissions The first volume includes 42 papers and a plenary lecture and is organized in topical sections on neural networks and evolutionary computation

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